

LYMNAEA RUPESTRIS SP. N. FROM SOUTHERN BRAZIL
(PULMONATA: LYMNAEIDAE)

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A new species of South American lymnaeid snail, Lymnaea rupestris, is described. So far it has been found only in its type-locality, Nova Teutônia, a village in the municipality of Seara (27° 07' S, 52° 17' W), state of Santa Catarina, Brazil. It is distinguishable, by characteristics of the shell and internal organs, from the other two lymnaeid species known to occur in the area, Lymnaea columella and L. viatrix.

Its shell has 4 markedly shouldered whorls, deep suture, ovoid or rounded aperture occupying about half the length of the shell, and reaches about 6 mm in length in adults; in columella and viatrix the shell has 4-5 rounded whorls, shallow suture, and reaches over 10 mm in adults; the aperture is ovoid, occupying about half the length of the shell in viatrix, about two thirds in columella.

Anatomically it is readily separated from L. columella by the shape of the ureter, straight in rupestris, with a double flexure in columella. Comparison with L. viatrix shows the following main differences: distalmost portion of the oviduct with a low, caplike lateral swelling in rupestris, with a well-developed pouch in viatrix; uterus bent abruptly caudalward in rupestris, only slightly curved rightward in viatrix; basal half of the spermathecal duct hidden by the prostate in rupestris, wholly visible or nearly so in viatrix; spermiduct sinuous and uniformly wide in rupestris, straight and gradually narrowing in viatrix; prostate more than half as long and nearly as wide as the nidamental gland, and with a slit-like lumen in cross-section in rupestris, less than half as long as and much narrower than the nidamental gland, and with an inward fold in cross-section in viatrix; penial sheath about as long and as wide as the prepuce in rupestris, shorter and narrower than the prepuce in viatrix.

An important ecological characteristic of L. rupestris is its habitat on wet rocks most often outside bodies of water, although in close proximity to them.

Specimens were deposited in the following malacological collections: Instituto Oswaldo Cruz, Rio de Janeiro; Academy of Natural Sciences, Philadelphia; Museum of Zoology, University of Michigan; and British Museum (Natural History).

In a recent paper on the distribution of Neotropical lymnaeids (Paraense, 1982) it was stated that only three species – Lymnaea viatrix, L. columella and L. cousini – were represented in the samples collected from 105 localities throughout the region. Refer-

ence was also made to specimens from Nova Teutônia, Santa Catarina state in south Brazil, figured by Hubendick (1951) as examples of *L. viatrix* and considered a different species by the present author. Hubendick's specimens from Nova Teutônia were collected by Mr. Fritz Plaumann in 1937 and deposited in the Naturhistoriska Riksmuseet, Stockholm.

In February 1982 I searched a number of bodies of water at Nova Teutônia, in company of Mr. Plaumann, without finding lymnaeids. As the work was impaired by rainy weather, subsequent searches were done by Mr. Plaumann late in March, resulting in the collection of 8 living specimens and 61 empty shells. The study of this material showed that it belongs to a new species, which is now described under the name *Lymnaea rupestris* (< Latin *rupes*, a rock: growing on or living among rocks).

As comparison with the closely related *Lymnaea viatrix* Orbigny, 1835 is frequently made in this paper, the reader is referred to Paraense's (1976) description of this species.

MATERIAL AND METHODS

Six living specimens were collected from a rocky bank of the Pinhalzinho creek, an affluent of the Ariranha river. They were found between 0.5 and 1 m above the stream level, on a mossy surface kept wet by trickling water from the surrounding ground. In addition, 61 empty shells were collected from similar environments along the creek.

A single living specimen was found on a wet rock beside a steep brook called "Cascata Saltinho", which ends into a pool that drains into the Ariranhazinho river, an affluent of the Ariranha. The specimen was located about 1 m above the pool level. Another specimen was collected from a hollow in the terraced rocky bed of a steep brook which empties into the Ariranha.

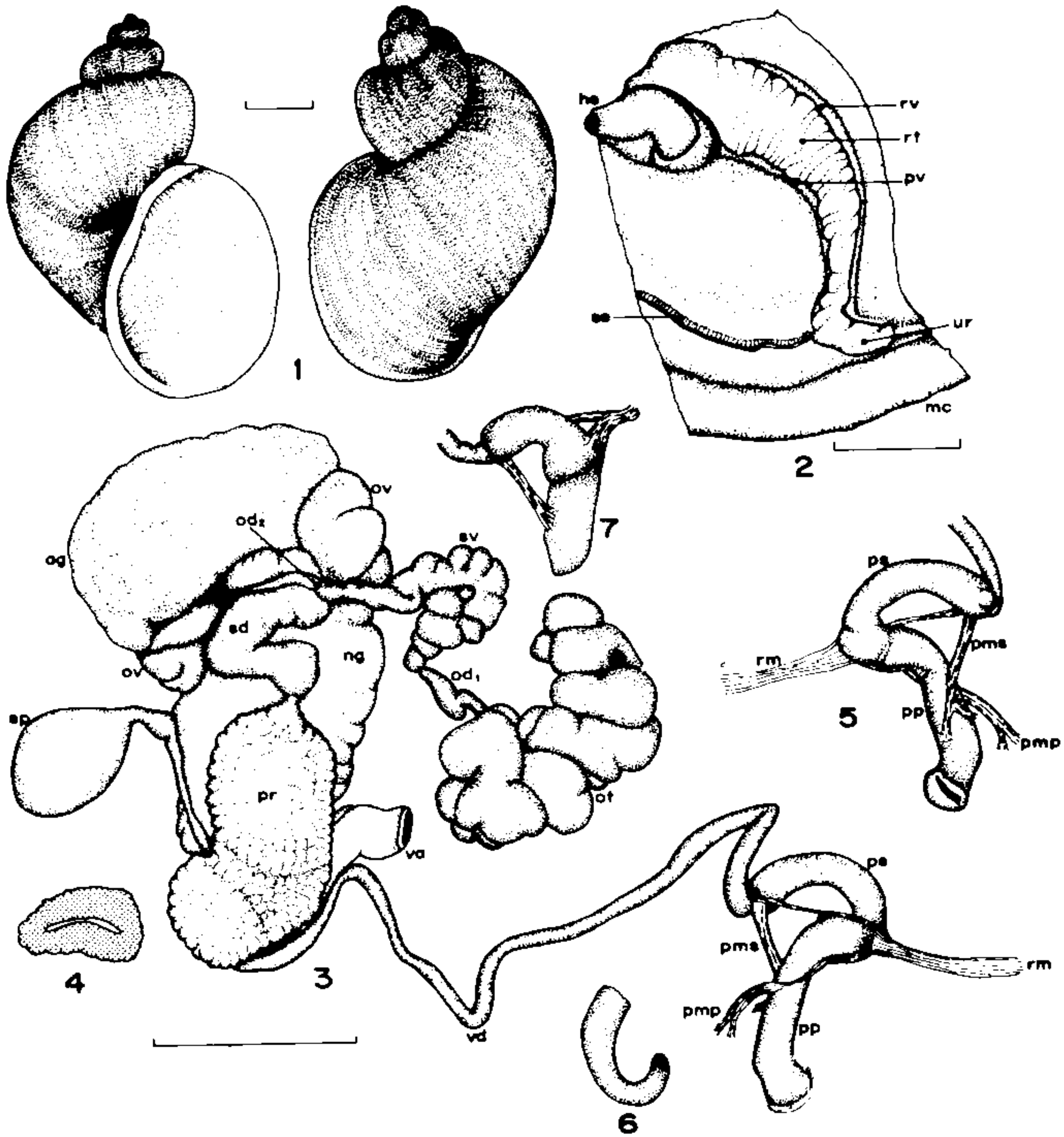
The living specimens were preserved in Railliet-Henry's fluid after relaxation in a 0.1% nembutal solution, and five of them were dissected under the stereomicroscope (for technical details see Paraense, 1981 :200).

The radulae were separated from the buccal mass by digestion, for about 6 hr, in a vial with 10% NaOH immersed in gently boiling water. They were then rinsed in tap water and placed in a drop of water on a microscope slide, with the dorsal (toothed) surface upward as in the living animal. After reducing to a minimum the amount of water, the radular plate was spread with two needles on the slide and mounted in Turtox non-resinous medium.

DESCRIPTION

The largest shell (Fig. 1) is 5.7 mm long and 3.9 mm wide, and has 4 whorls increasing in diameter rather rapidly, by a factor averaging 2.17. The whorls are inflated, markedly shouldered and separated by a deeply channelled suture which gives the spire a loosely wound appearance. The surface is marked by coarse, crowded growth lines. The aperture is ovate, 3.5 mm in length by 2.6 mm in width, occupying a little more than half the length of the shell; its inner lip is broadly reflected, covering to a variable extent the umbilical chink.

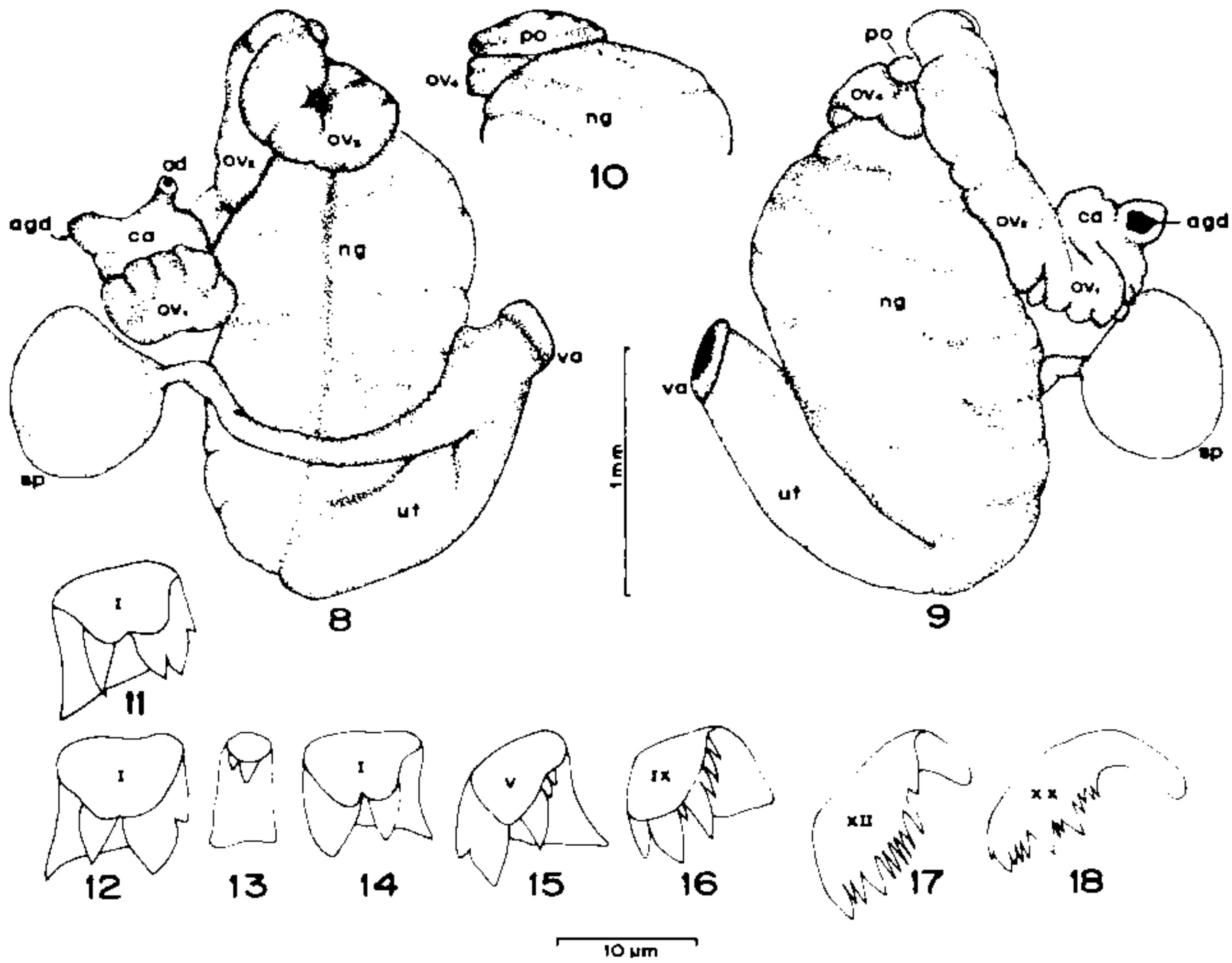
The cephalopodal mass is almost colorless, except for a gray pigmentation of the dorsal part of the head. The mantle roof shows two pigmented fields, separated by a transverse unpigmented stripe over the attachment of the septum between the pulmonary and hypoplelar cavities. The pigmentation is darker in the posterior than in the anterior field, and is absent in the mantle collar.



Lymnaea rupestris sp. n. — Fig. 1: shell of largest specimen. Fig. 2: roof of pulmonary cavity (he = heart, mc = mantle collar, pv = pulmonary vein, rt = renal tube, rv = renal vein, se = septum between pulmonary and hypopeplar cavities, ur = ureter). Fig. 3: genital system (ag = albumen gland, ng = nidamental gland, od₁ = proximal segment of ovispermiduct, od₂ = distal segment of ovispermiduct, ot = ovotestis, ov = oviduct, pmp = protractor muscle of prepuce, pms = protractor muscle of penial sheath, pp = prepuce, pr = prostate, ps = penial sheath, rm = retractor muscle of penial complex, sd = spermiduct, sp = spermatheca, sv = seminal vesicle, va = vagina, vd = vas deferens). Fig. 4: cross-section through middle of prostate. Fig. 5: penial complex of Fig. 3, from opposite side. Fig. 6: penis. Fig. 7: penial complex of smaller specimen. Bar = 1 mm.

The renal organ (Fig. 2) is similar to that of *L. viatrix*. It is a straight tube, lined with a folded epithelium, that tapers distalward to open behind the pneumostome through a right-angled short ureter. A very slender muscle thread runs lengthwise on the ventral surface of the renal tube, and a layer of very thin transverse parallel muscle fibers gives the inner side of the pulmonary wall a densely striated appearance.

The ovotestis (Fig. 3, ot) is a cluster of lobulate aëni pressed against each other around a collecting canal which continues into the ovispermiduct. The latter has a short



Lymnaea rupestris sp. n. — Fig. 8: female genital system, ventral view, albumen gland and male organs removed (agd = duct of albumen gland, ca = carrefour, ng = nidamental gland, od = outlet of ovispermiduct into carrefour, ov₁ ov₂ ov₃ = successive portions of oviduct, sp = spermatheca, ut = uterus, va = vagina). Fig. 9: female genital system, dorsal view (po = pouch of oviduct; other abbreviations as in Fig. 8). Fig. 10: part of female genital system to show location of pouch of oviduct (po) on last portion of oviduct (ov₄). Figs. 11-18: radular teeth. Figs. 11, 12: first left lateral teeth. Fig. 13: central tooth. Fig. 14: first right lateral. Fig. 15: first right intermediate. Fig. 16: first right marginal. Fig. 17: fourth right marginal. Fig. 18: twelfth (penultimate) marginal (Roman numerals indicate tooth position in horizontal row).

and very thin proximal segment (Fig. 3, od₁) continuing into the seminal vesicle (Fig. 3, sv). This is a bosselated swelling of the ovispermiduct which farther ahead narrows down (Fig. 3, od₂) to reach the carrefour. The relations of the carrefour with the ovispermiduct, oviduct and spermiduct are the same as in *L. viatrix*.

The albumen gland (Fig. 3, ag) is a bulky oblong organ, as usual in lymnaeids. The oviduct (Figs. 3, 8-10, ov) is highly convoluted, following a course similar to that described in *L. viatrix*; a little before emptying into the nidamental gland, the oviduct shows a lateral caplike swelling (Fig. 10, po) which seems to be homologous with the pouch of the oviduct of *L. viatrix* (muciparous gland or second accessory albuminiparous gland of authors). The nidamental gland (Figs. 3, 8-10, ng) is voluminous, oblong, widely convex dorsally, somewhat flattened ventrally, and crossed by nearly parallel wrinkles. It suddenly narrows into the uterus, about half as long as it, and which in the examined specimens bends abruptly caudalward, forming an acute angle with the right side of the nidamental gland (Figs. 8, 9, ut). The vagina is very short (Figs. 3, 8, 9, va). The spermatheca (Figs. 3, 8, 9, sp) has a roundish body and a long duct, about twice as long as the body, which gradually widens to reach the vaginal wall as a bulbous swelling; from its base to about half its length the duct is hidden by the overlying prostate. The body of the

spermatheca projects into the pulmonary cavity, pushing around itself a fold of the membrane that covers the dorsal surface of the visceral mass and adhering through it to the pericardial membrane and to the roof of the pulmonary cavity. As the long duct of the spermatheca remains embedded in the visceral mass, care must be taken on dissection not to sever the body from the duct.

The spermiduct (Fig. 3, sd) is uniformly wide, following a sinuous course over the ventral surface of the nidamental gland. On reaching about half the length of that gland it suddenly narrows and then swells again to form the prostate (Fig. 3, pr). The prostate is a bulky ablong organ with a rugged surface, narrower than the nidamental gland and attached to the ventral surface of the latter; in cross-section it shows a simple, slit-like lumen (Fig. 4). The vas deferens (Fig. 3, vd) emerges from the cephalic end of the prostate and, as usual in pulmonates, extends to a point on the margin of the male opening where, after interweaving with the surrounding tissue, it bends backward into a long loop to end in the penial sheath (Figs. 3, 5, ps). The penial sheath is cylindrical and shows a group of apparently six very minute apical bulges which correspond to inner chambers communicating with the lumen of the organ. The penis (Fig. 6), about as long as the penial sheath, tapers off to an unarmed tip with a terminal outlet. The prepuce (Figs. 3, 5, pp) is about as long and as wide as the penial sheath, less frequently a little wider, and has a sarcobelum. In three of the dissected specimens the penial sheath was a little invaginated into the prepuce, distending the proximal portion of the latter. The extrinsic muscles of the penial complex are arranged as follows (Figs. 3, 5, pm, rm): a retractor muscle (rm) arising from the columellar muscle and dividing, at a variable distance from its origin, into two branches which are attached, one to the top of the penial sheath, and the other to the top of the prepuce; and two separate protractor muscles (pm), of which one connects the top of the penial sheath to the tissue surrounding the distal portion of the prepuce, and the other connects the top of the prepuce to the inner tissues of the head wall. Besides these main muscles, some very thin ones, easily disrupted during dissection, connect the wall of the prepuce to the head wall and to fibers leading to the columellar muscle.

The radula of the largest specimen has 122 transverse rows of teeth and its formula is 21-1-21. The central tooth (Fig. 13) has a small narrow cusp and a minute accessory cusp high on its left. The first laterals have two cusps, the inner wide, the outer smaller and narrower (Fig. 4). Some first laterals, however, may show a simple (Fig. 12) or bifid (Fig. 11) inner cusp with a minute accessory cusp. The second to fourth or fifth laterals are bicuspid, as in Fig. 14. The fifth or sixth laterals show one or two accessory cusps high on the outer cusp, and a notched inner cusp (Fig. 15). From this point side-ward the teeth get increasingly multicuspitate, assuming the characteristics of marginals (Figs. 16, 18). The farthest marginals (Fig. 18) show three main cusps and about ten small accessory cusps. The radulae of the remaining four dissected specimens did not depart appreciably from the above description, except for the smaller numbers of transverse and longitudinal rows of teeth, in proportion with the smaller size of the animals.

COMPARISON WITH RELATED SPECIES

Reviewing the literature on Neotropical lymnacid shells I only could find two examples of shells resembling that shown in Fig. 1. One of them corresponds to Hubendick's (1951) above-mentioned figures of "*Lymnaea viatrix*", which in reality belong to *L. rupestris*. The other is shown by Castellanos & Landoni (1981, Plate 4, Fig. 5) and corresponds to a "supposedly teratologic specimen of *Lymnaea diaphana* from Monte Herrera, Tierra del Fuego".

So far as I am aware, only six of the nominal lymnacid species recorded in South America are sufficiently known anatomically to be compared for diagnostic purpose: *L. columella* Say, 1817, *L. peregrina* Clessin, 1882, *L. cósini* Jousseume, 1887, *L. viatrix* Orbigny, 1835, *L. cubensis* Pfeiffer, 1839 and *L. plicata* Scott, 1953

L. columella is readily separated from *L. rupestris* by the double flexure of its ureter, a feature described by Harry & Hubendick (1964, Fig. 4), and also present in *L. cousini* (Paraense, to be published). *L. peregrina* is a synonym of *L. columella*, as ascertained by examination of topotypic specimens (Paraense, to be published). *L. viatrix* has a ureter similar to that of *L. rupestris* but differs from the latter in its straight and gradually narrowing spermiduct (sinuous and uniformly wide in *L. rupestris*), in its much smaller prostate with an inward fold and leaving uncovered the duct of the spermatheca (much larger, unfolded and covering the basal half of the spermathecal duct in *L. rupestris*), in its penial sheath being shorter and narrower than the prepuce (about as long and as wide in *L. rupestris*), in the presence of a well-developed pouch of the oviduct (rudimentary in *L. rupestris*), in its uterus being slightly curved rightward (abruptly bent caudalward in *L. rupestris*), and in its shell having rounded whorls and shallow suture (markedly shouldered whorls and deeper suture in *L. rupestris*). *L. cubensis* is a synonym of *L. viatrix*, as verified on examination of Cuban specimens (Paraense, to be published). As to *L. plicata*, Scott's (1953) description lacks probably important details, no reference being made to the renal organ, but it differs from *L. rupestris* in the characteristics of the penial complex: penial sheath pear-shaped, about half as long as the prepuce and apparently narrower.

L. rupestris from Nova Teutônia is a small-sized snail, the largest specimens measuring about 6 mm in length (Hubendick's specimens are about the same size). If this characteristic is confirmed in populations from other localities it will be added to the above-mentioned interspecific differences.

Another peculiarity of *L. rupestris* is its preference for wet rocks most often outside bodies of water, although in close proximity to them. According to Mr. Plaumann, a professional entomologist and collector who, as a resident of Nova Teutônia, has scrutinized for about 60 years all the environments in the area, only exceptionally has the present lymnaeid been found inside a body of water. It shares its habitat with *Acrorbis petricola*, a planorbid whose description by Odhner (1937) was based on specimens from Nova Teutônia, collected by Mr. Plaumann and living "in wet moss, on rocks bathed with infiltrating water". In fact, during the collections for the present study, 22 specimens of *Acrorbis petricola* were found together with six *L. rupestris* on rocks of the Pinhalzinho creek, besides other specimens in similar environments.

RESUMO

É descrita uma nova espécie de limneídeo sul-americano, *Lymnaea rupestris*. Até agora só foi encontrada na sua localidade-tipo, Nova Teutônia, distrito do município de Seara (27° 07'S, 52° 17'W), Santa Catarina, Brasil. Distingue-se, pelos caracteres da concha e dos órgãos internos, das outras duas espécies conhecidas na área — *Lymnaea columella* e *L. viatrix*.

A concha de *L. rupestris* tem 4 giros subangulosos, sutura profunda, abertura ovóide ou arredondada ocupando cerca de metade do comprimento da concha, e atinge cerca de 6 mm de comprimento nos adultos; em *columella* e *viatrix* a concha tem 4-5 giros arredondados, sutura rasa, e atinge mais de 10 mm nos adultos; a abertura é ovóide, ocupando cerca de metade do comprimento da concha em *viatrix*, cerca de dois terços em *columella*.

Anatomicamente é fácil distingui-la de *L. columella* pela forma do ureter, reto em *rupestris*, com dupla flexão em *columella*. Comparada com *L. viatrix* apresenta as seguintes diferenças principais: porção mais distal do oviduto com baixa protuberância lateral em forma de barrete em *rupestris*, com uma bolsa bem desenvolvida em *viatrix*; útero dobrado abruptamente na direção caudal em *rupestris*, apenas ligeiramente curvado para a direita em *viatrix*; metade basal do canal da espermateca oculta pela próstata em *rupestris*, inteiramente ou quase inteiramente visível em *viatrix*; espermiduto sinuoso e

de largura uniforme em *rupestris*, reto e estreitando-se gradualmente em *viatrix*; próstata com mais de metade do comprimento e quase da mesma largura da glândula nidamental, e com luz simples em forma de fenda em corte transversal em *rupestris*, com menos de metade do comprimento e muito mais estreita que a glândula nidamental, e com uma prega da parede projetando-se na luz em corte transversal em *viatrix*; bainha do pênis mais ou menos do mesmo comprimento e da mesma largura que o prepúcio em *rupestris*, mais curta e mais estreita que o prepúcio em *viatrix*.

Importante característica ecológica de *L. rupestris* é seu habitat em rochedos muito úmidos, localizados mais freqüentemente fora das coleções hídricas porém contíguos a elas.

Foram depositados exemplares nas seguintes coleções malacológicas: Instituto Oswaldo Cruz, Rio de Janeiro; Academy of Natural Sciences, Philadelphia; Museum of Zoology, University of Michigan; British Museum (Natural History).

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